

Major Categories of Strategies

CHAPTER 8



The complex mix of land uses, habitat types, and lifestyles in the greater Portland-Vancouver region requires an equally broad array of approaches to conserving and enhancing the region's biodiversity and related ecosystem services. As with the strategies in the *Regional Conservation Strategy*, the set of strategies presented in this chapter is neither prescriptive nor prioritized. Instead the strategies are meant to provide a reasonably comprehensive framework of important ways that individuals and organizations can make sound, strategic investments of their time and resources, based on their own priorities and interests. It is hoped that, within these strategies, each stakeholder group, jurisdiction, agency, and individual in the region can find a way to positively engage in protecting our region's most crucial natural assets or to better frame their efforts in light of regional priorities.

Naturally, the content of this chapter overlaps substantially with that of the *Regional Conservation Strategy for the Greater Portland-Vancouver Region*. In fact, four of the six topics addressed here (biodiversity corridors, conservation in developed areas, conservation in working lands, and conservation education) are explored in more depth in the *Regional Conservation Strategy* and

are presented here in shortened form. Two other sections (preservation/conservation and habitat restoration and enhancement) are treated most comprehensively here.

Preservation and Conservation

Esther Lev, The Wetlands Conservancy, and Jonathan Soll, Metro

Governments, nonprofit organizations and private landowners have a variety of tools to choose from to protect or conserve natural areas and to connect or restore habitat. Many approaches offer private landowners ways to realize financial benefits, including direct income, estate tax reductions and, in some cases, income and property tax reductions. Approaches can be roughly divided into protection/acquisition and conservation.

Protection/Acquisition

Protection/acquisition generally implies taking land out of the economic system. Permanent protection is most appropriate for areas that are very highly sensitive to use, rare or irreplaceable, or essential to the protection of landscape processes, habitat, or species. Permanent protection prevents these critical lands from being lost or degraded.

Education and outreach are vital in promoting the use of appropriate conservation tools.



Generally, there are two ways to achieve permanent protection of land:

- **Permanent, full-fee, title ownership** through acquisition of all property rights. This can be accomplished through sale or donation of the land.



- **Partial ownership** of the development or use rights to the land through a conservation easement.

SALE OPTIONS (TITLE TRANSFER WITH COMPENSATION)

Landowners can choose from four sale options, each of which has advantages:

- **Fair market value:** The landowner sells the property for its fair market value. This allows the landowner to receive full value for the property.



- **Bargain sale:** The landowner sells the property to a land trust, conservation organization, or agency at a price below the fair market value, with the difference between the sale price and the fair market value being considered a donation. The seller may qualify for a tax deduction and a reduction in capital gains taxes.

- **Installment sale:** The landowner sells the property to a land trust, conservation organization, or agency and defers all or part of the consideration, which is paid in successive years. In installment sales, payment of the capital gains tax can be deferred until the seller has the cash in hand with which to pay the tax.

- **Right of first refusal:** The landowner gives a land trust, conservation organization, or agency the option to match a purchase offer and acquire the land if another buyer approaches the landowner. Right of first refusal can give land trusts and other conservation organizations time to acquire the funds needed to purchase the land.

The disadvantage of all types of property sales is that, if the land value has appreciated since it was purchased; the seller becomes liable for the income tax on the capital gain.

DONATION OPTIONS (TITLE TRANSFER WITHOUT COMPENSATION)

Landowners can choose from three types of donations: outright donation, donation at the time of death, and donation with a reserved life estate. Each of these has advantages and drawbacks.

Outright donation grants full title and ownership to the conservation organization, community, or government agency that receives the donated property. Outright donation has several advantages: money is not needed to protect the property, so the donation frees resources for other sites; it is a simple, clean, and efficient transfer of responsibilities and rights, and it offers the maximum tax benefit for donor. However, the property owner loses all value, and some property owners may not be able to take full advantage of the tax benefit.

Donation at the time of death transfers property through a will and allows the property owner to use the property until death. Like outright donation, donation at the time of death does not require money to protect the property, so it frees resources for other sites, plus it is a simple, clean, and efficient transfer of responsibilities and rights. Its disadvantages are that heirs may contest the will, tax benefits for the donor may be less, and society does not begin reaping the benefits of donation until the donor's death.

Donation with a reserved life estate permits the landowner to use the donated property during his or her lifetime and the lifetimes of designated family members. This eliminates the risk of heirs contesting the will and allows the property owner

to use the property until death. In addition, well-written life estates begin providing public benefit immediately. However, donations with a reserved life estate can create a complex relationship between the donor and the land manager. Other disadvantages are that tax benefits for the donor are less than those with outright donation and society does not reap the full benefits until the donor's rights expire.

CONSERVATION EASEMENTS

Landowners can restrict how land may be used through written agreements, called easements. These become part of the property deed and stay with the land, binding subsequent property owners to the terms of the agreement. With a conservation easement, the landowner retains title to the property but transfers certain property rights to a land trust, government agency, or nonprofit conservation organization. Through the easement, the landowner can restrict the type and amount of development on a piece of property in order to protect significant natural features, including wildlife or habitat. Each conservation easement is tailored to the particular piece of property and the wishes of the landowner. The parties involved can renegotiate the easement if circumstances change (although there may be tax implications).

Advantages of Conservation Easements

- Easements provide income tax, estate tax, and gift tax benefits if the easement is donated or sold at less than market value.
- The property owner retains ownership of the property while potentially receiving income tax, estate tax, and property tax reductions.
- The easement holder generally pays less than for full fee ownership.

Disadvantages of Conservation Easements

- Easements can involve giving up some property usage rights.
- The landowner may need to maintain the land and be responsible for expenses, including taxes.

- Because easements run with the deed, the holder has a relationship with unknown future landowners.

- Management responsibility can be complicated.

Conservation

Conservation allows for the active use of the land while habitat values and ecosystem services are maintained over time. Conservation can apply to areas used for resource production. For example, owners of land used for agriculture and forestry are encouraged to apply best management practices such as no-till seed drilling, riparian and wetland buffers, or longer harvest rotations.

Conservation also applies to urbanizing areas where changes in land use might adversely affect a resource. Conservation of natural areas is a concern in urbanizing settings where adjacent use by humans affects wetlands, streams, riparian areas, meadows, and forest lands. Improved management practices on the part of homeowner associations, private landowners, land developers, watershed councils, schools, and volunteer groups can help to reduce impacts. Education and outreach are vital in promoting the use of appropriate conservation tools.

Enhancing Biodiversity Corridors and Regional Connectivity

Lori Hennings, Metro

Preservation, conservation, restoration, and invasive species control are some of the tools available and necessary to improve regional connectivity among the priority conservation areas and potential biodiversity connectivity areas shown on maps that accompany this *Biodiversity Guide*. The maps depict potential biodiversity corridors based on aerial photo interpretation, modeling, and local knowledge, but they also suffer from significant data and research gaps. Additional work is needed to assess the functionality of these biodiversity corridors and determine what is necessary to make them fully functional. The following strategies outline steps

to address these gaps, improve corridor function, and better prioritize restoration and enhancement activities:

1. Gather available information on barriers, existing wildlife crossing structures, and solutions. For example, various agencies have identified priorities for removing culverts that block fish passage.

2. Establish a wildlife connectivity communication venue and/or working group consisting of partners and stakeholders identified through the *Biodiversity Guide's* biodiversity corridors mapping process and other interested parties.

3. Collaborate closely with organizations and individuals that work in or near corridors or that own land there (e.g., transportation and trails organizations, industry, homeowners' associations, parks providers, and large-lot landowners or groups of landowners where action or education is needed). Talk with them about why the corridor is important and provide maps and information. Ask them to help identify potential conflicts and opportunities, and how we might partner with them; they may know more than we do.

4. Conduct research to assess the condition and actual function of mapped corridors in order to improve corridor function and regional priority setting:

- Assess which wildlife species actually use or are likely to use mapped corridors and which species could or should be using them. A logical early step in this process is to assign focal species to each corridor based on the habitat areas it connects.
- Assess current habitat conditions and identify and characterize existing partial or full barriers, including gaps in vegetation.
- Use the information from the previous steps to prioritize restoration and enhancement actions.
- Correct barriers and gaps strategically but opportunistically. For example, major road work may occur infrequently in a given area but can provide key construction and funding opportunities to address barriers. Major trail work may provide similar opportunities.

- Conduct pre- and post-monitoring on wildlife crossings for several years. Sometimes it takes a few years for target species to use a crossing, and small adjustments can make all the difference.

5. Periodically refine the maps and priorities as data and analytical tools improve.

Habitat Restoration and Enhancement

Esther Lev, The Wetlands Conservancy, and Jonathan Soll, Metro

Most natural areas and the surrounding landscapes in the greater Portland-Vancouver region have been significantly altered. Impacts include direct changes such as ditching, drain tile installation, stream channelization, sedimentation, removal of vegetation, grazing, logging, loss of habitat structure, and planting or invasion of non-native species. Even when direct human impacts on a site have been slight, their effects may be significant because of changes in the natural environment and the processes that historically maintained the region's biological communities. Natural area managers must deal with the impacts of such threats as invasive non-native species, fire exclusion, altered streams and water systems, and landscape fragmentation as a result of roads, pipelines, and development in order to maintain or improve the biodiversity of the region and its natural areas. Fortunately, in most cases even natural areas that are severely out of balance in composition, structure, and function and have been highly altered from their original condition or isolated from other similar habitat can be move toward a healthier and ecologically productive condition through carefully designed and implemented restoration or enhancement projects.

Restoration Projects

Generally speaking, restoration projects seek to reestablish conditions similar to the original condition of an area that has been highly altered by human activity. Successful restoration usually is

based on re-establishing an area's original hydrology, topography, and natural processes, such as flooding, and commonly includes re-establishing the original native plant cover.

EXAMPLES OF RESTORATION PROJECTS

Many urban streams have been filled, covered, or straightened. A restoration project might involve daylighting a stream (i.e., re-routing it out of an underground pipe and back onto the surface), re-meandering a channelized stream (i.e., making it curvy), or installing fish- and wildlife-friendly culverts. As other examples, agricultural fields can be restored to wetland or upland prairie habitat, or an even-age single-species forest can be managed toward a diverse forest with old-growth characteristics.

Enhancement Projects

Although there is no hard and fast distinction between restoration and enhancement, enhancement projects generally are less extreme and strive to maintain or increase a particular set of functions of an existing natural area. Enhancement compensates for natural processes that no longer exist or mitigates the effects of historical impacts, thereby helping to move moderately or even severely degraded natural areas to a higher quality condition. Generally, enhancement projects target improved wildlife habitat and native vegetation diversity. Specific enhancements might include prescribed burns, invasive species control, native plantings, or adding nest boxes or large wood for wildlife.

Enhancement can also change the physical characteristics of a largely functioning natural system, such as by impounding water behind a dike or dam, or by dredging a pond in a relatively undisturbed wetland. Enhancement techniques should be evaluated carefully because one-time enhancement projects can cause unintended problems for future projects on the same site.

EXAMPLES OF ENHANCEMENT PROJECTS

Many natural areas are severely degraded by invasive plants. Invasive species removal projects aim to increase overall plant and animal diver-



sity via active management of the undesirable species. An example of a management/enhancement plan for a degraded oak woodland would be to reduce fuels by removing competing woody vegetation, initiate a prescribed burn, eliminate the invasive plant species, and plant native species to encourage wildlife habitat and nesting areas. Other examples of simple enhancement actions are planting cedar trees underneath the canopy of a maple-dominated forest, planting shrubs in a grass-dominated wetland, and removing competing conifers from an oak woodland.

Overview of the Practice of Natural Area Restoration and Enhancement

Restoration or enhancement of natural systems and communities is an adaptive process that typically plays out over many years. A successful project requires a good understanding of the critical elements of a site, its ecological dynamics, and the functions it plays in the greater landscape and in maintaining watershed health. It also is important to have a clear goal and well-defined statement of the desired future conditions for the site. Ideally the goal of every project would be return to historical conditions, but not all sites can be returned to their historical state. For example, the manager may control only part of the original site, or some ditches might need to

be retained so that adjoining properties do not flood. Onsite or watershed hydrology might have been altered. Neighbors may not cooperate, or some elements that are inconsistent with historical conditions may need to be retained for social or economic reasons. Despite these sorts of limitations, in most cases meaningful enhancement and restoration can still occur if they are carefully planned and executed.

Forces of nature, climate change, and unknown elements of a site can alter even the best-planned design. Climate modeling suggests that, in this region, temperatures and the amount of winter precipitation will increase, while summer precipitation will decrease. Some natural areas may prove to be sensitive to changing climate because they depend on precipitation as their primary hydrologic input (although the timing of the predominant rainfall is predicted to remain somewhat consistent, mostly falling from November through March). As a result, monitoring, adaptive management, and long-term maintenance are as important as the initial planning of successful projects.

A typical restoration project involves the following:

1. Site visits and research. In the early stages of brainstorming, take a trip around the watershed and subbasin. Look for potential reference sites that model the desired future conditions for the restoration project and identify similar types of

projects within the subbasin and region. Learn what worked, what changes were necessary, and what might be done differently if the project were being done today.

2. Planning. Once there is a general concept for the project, define specific measures of success. Design a very detailed plan to achieve those measures of success and develop a task list, timeline, and budget. Expect to experience unexpected results and delays and be prepared to adapt your plan accordingly.

3. Long-term view. Restoration is a long-term commitment. Developing the desired future condition is likely to take years or decades, or possibly even centuries. Make sure that your organization has the long-term staffing or volunteers and the funding needed to stay involved for the long term and ensure a truly successful project.

Although sometimes expensive and usually challenging, restoration and enhancement of habitat can be essential in building and maintaining a healthy ecosystem in the greater Portland-Vancouver region. Restoration and enhancement can directly improve habitat quality, return and restore missing ecological functions and processes, remove and mitigate for existing stressors, connect isolated habitats, and improve regional connectivity, thereby improving our region's biodiversity, water quality, wildlife habitat, and resilience to climate change.

Conservation in Developed Areas

In the greater Portland-Vancouver region, developed lands are all lands except natural areas, waterways, wetlands, biodiversity corridors, working agricultural lands, and working forests. The developed landscape includes industrial, commercial, and residential properties, developed parks, schoolyards, golf courses, cemeteries, airports, and the streetscape. The intensity of development ranges from skyscrapers in downtown Portland to suburban and rural neighborhoods in surrounding communities.

Nearly 22 percent of the land within the greater Portland-Vancouver region is covered by residential, commercial, and industrial development and roadways. Developed areas include

active open spaces such as ball fields, school yards, and cemeteries, which can provide some of the ecological functions that natural areas do. With more ecological foresight we might have carefully nested our developed areas among an interconnected system of natural features in a way that prioritizes the function of natural systems. However, today's developed lands are situated such that remnant natural areas are highly fragmented, the tree canopy is only a fraction of historical levels, and historical streams, wetlands, and floodplains have been degraded, filled in, or covered over. In addition, our urban landscapes are replete with an array of wildlife hazards that includes buildings, powerlines, roadways, free-roaming domestic animals, and toxins. Despite these challenges, a huge diversity of wild animals, both migrant and resident populations—including some highly imperiled species—make use of our developed landscapes for some or all of their lifecycle. In addition, nearly 80 percent of the U.S. population now resides in cities, creating a culture of conservation that will depend on engaging people in wildlife stewardship where they live, work and play.

Developed areas have a vital role to play in preserving regional biodiversity and protecting environmental health. When effectively managed, developed lands increase the urban landscape's overall permeability for wildlife, enhance the functionality of natural areas and biodiversity corridors, and engage the public in wildlife stewardship. When we choose to integrate nature into all aspects of the built environment, developed lands have the potential to do the following:

- Increase the permeability of the overall urban landscape for migrating wildlife populations
- Reduce direct and indirect impacts on natural areas
- Reduce hazards to wildlife
- Protect critical resident wildlife populations
- Support equity and community health
- Foster stewardship and community engagement in conservation

The desired future condition for developed areas is one in which nature is incorporated into the built environment at all spatial scales—from the small urban home lot to towering skyscrapers and expansive industrial parks. We envision a developed landscape where each development and redevelopment project incorporates elements that provide habitat and reduce wildlife hazards, where green infrastructure meets habitat and biodiversity objectives (among others), and where the public is actively engaged and supported in stewardship of native plants and wildlife in their yards, neighborhoods, business districts, and communities.

This vision of the future condition of developed lands acknowledges that there is no clear dividing line between the built environment and the natural environment. Native plants and wild animals do not recognize our arbitrary boundaries, and the impacts of our developed landscapes extend far beyond their actual footprint. In short, we all have a role to play in the protection, restoration, and management of our native plant communities and local wildlife populations.

STRATEGIC ACTIONS

The *Regional Conservation Strategy* identifies the following strategies to ensure that the full biodiversity potential of the built landscape is realized and that detrimental impacts on wildlife are minimized. These include the following:

- **Increase the permeability of the developed landscape for wildlife populations by integrating the built and natural environments.** The integration of green infrastructure at all scales of development activity can dramatically increase the ability of wildlife to traverse the urban landscape and meet their needs at different phases of their lifecycle. Examples include habitat-focused ecoroofs, street trees, backyard naturescaping, wildlife crossings on roadways, and bank restoration at river industrial sites.
- **Identify and manage at-risk species that have critical populations residing on the built landscape.** A number of at-risk species use the built landscape for some portion of their lifecycle. Examples include (1) the tens of thousands of migrat-



ing Vaux's swifts that use Chapman School's chimney for roosting during their fall migration, and (2) peregrine falcons, for whom Portland-Vancouver area bridges provide significant nesting habitat (i.e., more than 5 percent of their known nesting sites).

■ **Identify and reduce wildlife hazards in the built environment.** Tremendous numbers of wild animals die each year as a result of collisions with manmade structures, predation by free-roaming domestic animals, and exposure to toxins. Identifying and addressing the most significant hazards is critical in ensuring that both the built and natural environments meet their full potential. Examples of proven effective strategies include reducing nighttime non-essential lighting on tall buildings during bird migration and adopting bird-friendly building guidelines to reduce collisions.

■ **Engage the general public in wildlife stewardship.** With 80 percent of the U.S. population residing in cities, raising awareness and promoting stewardship in the built environment is essential in reconnecting people to the landscape and promoting a culture of conservation in future generations. Programs that promote residential rain gardens, backyard naturescaping, and schoolyard restoration can engage new and diverse audiences in biodiversity conservation and send an important message that each of us has a role to play in restoring wildlife populations. Surprisingly, the greater Portland-Vancouver region's most popular wildlife viewing spot is not found in one of the region's natural areas or wildlife refuges. Rather, it is in a schoolyard in Northwest Portland, where each evening in the fall hundreds and sometimes thousands of people gather to watch tens of thousands of Vaux's swifts descending into the Chapman School chimney, which serves as a substitute for increasingly rare hollowed-out old-growth trees that the swifts historically roosted in on their annual southward migration. As the Vaux's swifts demonstrate, the greater Portland-Vancouver region will remain critical habitat for myriad wildlife populations, both resident and migratory. By increasing permeability, reducing hazards, targeting critical

local wildlife populations for special management, and promoting wildlife stewardship among urban residents, we can help ensure that the built landscape enhances rather than undermines regional biodiversity.

Conservation in developed areas is discussed more thoroughly in Chapter 6 of the Regional Conservation Strategy.

Conservation in Working Landscapes

Working lands are farms and forests that support the production of natural resource-based commodities that sustain rural lifestyles and contribute to the regional economy. The physical and chemical characteristics of working lands allow them to support the production of plants and animals for sale in the marketplace, contribute some habitat and ecological functions, and provide some ecosystem services such as air and water purification, sequestration of carbon, and flood attenuation. Unlike developed and natural lands, working lands are actively managed with intent to yield an economic return through harvest and management activities.

Working lands are an integral part of the economy, identity, and culture of the greater Portland-Vancouver region. Working lands also are vital to regional conservation. Lands used for agriculture and timber production serve as critical connectors between the region's urban areas (located at river confluences), and state and federally managed land at the headwaters of the region's many watersheds.

When properly cared for, working lands are part of the matrix of lands that capture, retain, and filter water. In some areas, streams and rivers overflow onto working lands during the winter, serving to protect downstream areas from floods. Standing timber and agricultural plants sequester carbon, while soil holds carbon underground. Working lands serve as buffers for natural areas and can help support connectivity between natural areas within the region.

Working lands can be successfully managed both for production and for their conservation values, with mutually beneficial results. A strong

economic return enables land managers to continue natural resource protection on their land while increasing their ability to produce food and fiber. This results in a sustainable farm and forestland base to be managed by future generations. Working lands that are economically viable are more likely to stay in production and retain those qualities that serve conservation purposes. In the long run, working lands will be as important to the region's sustainable future as housing and other forms of development, and they will be critical in addressing our future needs for local food, clean water, healthful air, and other ecosystem services.

The desired future condition for working lands is preservation and enhancement of their integrity and function as critical components of both regional conservation and a sustainable local food and fiber economy. We envision a future in which funding opportunities exist for a new generation of farmers to purchase or lease land, and landowners who lease out property do so in a manner that encourages long-term conservation investments. We envision streams and riparian areas on working lands functioning at a level that mirrors pre-settlement conditions to the extent possible, and farms and forestland that help to maintain the resilience of natural systems in the face of climate change. We envision individuals of all economic backgrounds being able to obtain a majority of their food needs locally, agriculture being incorporated into new developments through community gardens, and viable farms and forest lands being protected from development caused by an expanding human population.

THREATS AND CHALLENGES

- Urban development
- Conversion to "hobby" farms
- Declining revenues for food and fiber production
- Lack of recognition of the importance of protecting working lands

■ Challenges of transferring land to the next generation

- Short-term farm leases
- Limited funding for conservation

STRATEGIC ACTIONS

- Increase financial support for conservation activities on working lands.
- Improve management of working lands for habitat value and water quality.
- Explore better integration of farming and forestry into natural area management, including on publicly owned lands.
- Increase farm and forestland easements to prevent conversion to other uses and support the long-term economic viability of local farm and forestland.
- Provide funding and support for new farmers to purchase or lease farms, so that they are not developed.

Conservation Education

Conservation education is education that explores people's place in and connection with the natural world. Whether structured or non-formal, conservation education increases people's environmental literacy by showing how their actions affect the natural world around them, both positively and negatively¹. Content and modes of instruction vary, but most conservation education programs focus on individuals' decisions as part of the learning process and strive to connect students of all ages to the local environment; thus, students are encouraged to "act locally" even as they learn to "think globally" about the connections between human behavior and natural processes and conditions.

The conservation, sustainability, and environmental education programs of the region strive to improve participants' understanding and appreciation of the natural world. An intended long-term outcome of these efforts is creation of

¹ The Oregon Environmental Literacy Plan, prepared by the Oregon Environmental Literacy Task Force in 2010, defines environmental literacy as an individual's understanding, skills, and motivation to make responsible decisions that take into consideration his or her relationships to natural systems, communities, and future generations.

an environmentally literate and engaged populace, meaning a citizenry that can make informed conservation-related decisions, is motivated to take appropriate actions, and promotes those behaviors to others. A goal that already has been achieved is the establishment of the Intertwine Conservation Education Council (i.e., Con Ed Council) to represent all conservation, sustainability, and environmental education providers in the region. The Con Ed Council currently is working to strengthen providers' roles in the region's conservation education efforts. Identified concerns stem from a central belief that decreased recognition of people's place in and connection with the natural world can negatively affect the environment. Consequently, the Con Ed Council envisions the greater Portland-Vancouver region as a place where everyone shares a connectedness with nature.

A variety of educational services and activities already are taking place within the region and among Intertwine Alliance partners. These activities blend service learning, personal and group development, conservation and environmental education, and direct conservation efforts. Intertwine Alliance partners are a diverse group, with varied constituencies. Some partners are geographically limited and concerned with a specific resource or site; examples include "friends" groups and watershed councils. Other partners address larger portions of the region but single out specific animals or natural features to focus on. Public agencies such as city governments, soil and water conservation districts, and service districts play a role in conservation education. Schools and school districts also are valuable partners, generating and using service learning and conservation resources for students and teachers. Notably, schools are an institutional support for environmental literacy as called for in the 2010 Oregon Environmental Literacy Plan.

Much conservation education in the region occurs outside the formal education institutions. Non-formal conservation education may meet clearly defined objectives through organized educational activities such as field trips, group restoration work and other work crews, camp programs, scouting, afterschool programs, or community classes. Some conservation education is self-directed, taking place during visits to parks, natural areas, refuges, and demonstration gardens.

The Intertwine's current network of parks, trails, and natural areas is the result in part of earlier investments in conservation education. In the same way, the effectiveness of future community engagement and decision making on conservation issues will depend on continued—and possibly improved—environmental literacy. One critical issues in which conservation education is likely to influence policy outcomes is management of human population growth in the region. In addition, conservation education is key to non-regulatory controls, such as prevention of illegal dumping and invasive species control. Nationally, formal education increasingly incorporates volunteerism, service learning, and other strategies to address science, engineering, technology, and mathematics learning and student achievement. And many current conservation efforts in the region, such as development and protection of backyard habitat, watershed restoration, tree canopy protection, and wildlife monitoring, rely on adequate levels of volunteer knowledge and engagement. Moreover, key regional conservation documents, such as Building Climate Resiliency in the Lower Willamette Region of Western Oregon,² recommend environmental literacy as part of implementation. Clearly, environmental literacy has the potential to affect everything from daily lifestyle choices to community and political engagement.

² Building Climate Resiliency in the Lower Willamette Region of Western Oregon: A Report on Stakeholder Findings and Recommendations (Climate Leadership Initiative, 2011).